CLAIMS

We claim:

1. A method for forming porous silicon oxide film, comprising the steps of:

providing a CVD chamber having inner walls and a wafer chuck/heater;

pre-coating at least a portion of the CVD chamber inner walls with a layer of first PECVD silicon oxide film having a first thermal CVD oxide deposition rate thereupon;

placing a semiconductor wafer on the wafer chuck/heater within pre-coated CVD chamber; the semiconductor wafer including an upper second PECVD silicon oxide film having a second thermal CVD oxide deposition rate thereupon that is less than the first thermal CVD oxide deposition rate upon the first PECVD silicon oxide film coating the CVD chamber inner walls; and

depositing a porous silicon oxide film upon the upper second PECVD silicon oxide film overlying the semiconductor wafer; the porous silicon oxide film being different from the first PECVD silicon oxide film coating the CVD chamber inner walls.

2. The method of claim 1, including the step of pre-heating the semiconductor wafer before depositing the porous silicon oxide film.

3. The method of claim 1, wherein the first PECVD silicon oxide film coating the CVD chamber inner walls has a thickness of from about 100 to 8000Å; the upper

second PECVD silicon oxide film overlying the semiconductor wafer has a thickness of from about 100 to 2000Å; and the porous silicon oxide film has a thickness of preferably from about 500 to 10,000Å.

4. The method of claim 1, wherein the deposition of porous silicon oxide film is conducted at: a temperature from about 300 to 500°C; a TEOS flow rate from about 100 to 600 sccm; an ozone flow rate from about 1000 to 7000 sccm; and a time from about 20 to 400 seconds.

5. The method of claim 1, wherein the deposition of porous silicon oxide film is conducted at: a temperature from about 350 to 450°C; a TEOS flow rate from about 150 to 350 sccm; an ozone flow rate from about 4000 to 6000 sccm; and a time from about 50 to 350 seconds.

6. The method of claim 1, wherein the deposited porous silicon oxide film has a density of from about 2.0 to 2.9 g/cm^3.

7. The method of claim 1, wherein the deposited porous silicon oxide film has a density of from about 2.2 to 2.4 g/cm^3.

8. The method of claim 1, wherein the first PECVD silicon oxide film pre-coating the CVD chamber inner walls is comprised of PE TEOS oxide; and the upper second PECVD silicon oxide film over the semiconductor wafer is comprised of PE SiH_4 oxide.

9. The method of claim 1, including the step of pre-heating the semiconductor wafer to from about 250 to 500°C before depositing the porous silicon oxide film.

10. The method of claim 1, including the step of pre-heating the semiconductor wafer to from about 350 to 420°C before depositing the porous silicon oxide film.

11. A method for forming porous silicon oxide film, comprising the steps of:

providing a CVD chamber having inner walls and a wafer chuck/heater;

pre-coating at least a portion of the CVD chamber inner walls with a layer of first PECVD silicon oxide film having a first thermal CVD oxide deposition rate thereupon;

placing a semiconductor wafer on the wafer chuck/heater within pre-coated CVD chamber; the semiconductor wafer including an upper second PECVD silicon oxide film having a second thermal CVD oxide deposition rate thereupon that is less than the first thermal CVD oxide deposition rate upon the first PECVD silicon oxide film coating the CVD chamber inner walls;

pre-heating the semiconductor wafer; and

depositing a porous silicon oxide film upon the upper second PECVD silicon oxide film overlying the semiconductor wafer by a thermal CVD process; the porous silicon oxide film being different from the first PECVD silicon oxide film coating the CVD chamber inner walls.

12. The method of claim 11, wherein the first PECVD silicon oxide film coating the CVD chamber inner walls has a thickness of from about 100 to 8000Å; the upper second PECVD silicon oxide film overlying the semiconductor wafer has a thickness of from about 100 to 2000Å; and the porous silicon oxide film has a thickness of from about 500 to 10,000Å.

13. The method of claim 11, wherein the thermal CVD deposition of porous silicon oxide film is conducted at: a temperature from about 300 to 500°C; a TEOS flow rate from about 100 to 600 sccm; an ozone flow rate from about 1000 to 7000 sccm; and a time from about 20 to 400 seconds.

14. The method of claim 11, wherein the thermal CVD deposition of porous silicon oxide film is conducted at: a temperature from about 350 to 450°C; a TEOS flow rate from about 150 to 350 sccm; an ozone flow rate from about 4000 to 6000 sccm; and a time from about 50 to 350 seconds.

15. The method of claim 11, wherein the thermal CVD deposited porous silicon oxide film has a density of from about 2.0 to 2.9 g/cm^3.

16. The method of claim 11, wherein the thermal CVD deposited porous silicon oxide film has a density of from about 2.2 to 2.4 g/cm^3.

17. The method of claim 11, wherein the first PECVD silicon oxide film pre-coating the CVD chamber inner walls is comprised of PE TEOS oxide; and the upper second

PECVD silicon oxide film over the semiconductor wafer is comprised of PE SiH_4 oxide.

18. The method of claim 11, wherein the semiconductor wafer is pre-heated to from about 250 to 500°C.

19. The method of claim 11, wherein the semiconductor wafer is pre-heated from about 350 to 420°C.

20. A method for forming porous silicon oxide film, comprising the steps of:

providing a CVD chamber having inner walls and a wafer chuck/heater;

pre-coating at least a portion of the CVD chamber inner walls with a layer of first PECVD silicon oxide film having a first thermal CVD oxide deposition rate thereupon;

placing a semiconductor wafer on the wafer chuck/heater within pre-coated CVD chamber; the semiconductor wafer including an upper second PECVD silicon oxide film having a second thermal CVD oxide deposition rate thereupon that is less than the first thermal CVD oxide deposition rate upon the first PECVD silicon oxide film coating the CVD chamber inner walls;

pre-heating the semiconductor wafer; and

depositing a porous silicon oxide film upon the upper second PECVD silicon oxide film overlying the semiconductor wafer by a thermal CVD process temperature of from about 300 to 500°C; the porous silicon oxide film being

different from the first PECVD silicon oxide film coating the CVD chamber inner walls.

21. The method of claim 20, wherein the first PECVD silicon oxide film coating the CVD chamber inner walls has a thickness of from about 100 to 8000Å; the upper second PECVD silicon oxide film overlying the semiconductor wafer has a thickness of from about 100 to 2000Å; and the porous silicon oxide film has a thickness of from about 500 to 10,000Å.

22. The method of claim 20, wherein the thermal CVD deposition of porous silicon oxide film is further conducted at: a TEOS flow rate from about 100 to 600 sccm; an ozone flow rate from about 1000 to 7000 sccm; and a time from about 20 to 400 seconds.

23. The method of claim 20, wherein the thermal CVD deposition of porous silicon oxide film is conducted at: a temperature from about 350 to 450°C; a TEOS flow rate from about 150 to 350 sccm; an ozone flow rate from about 4000 to 6000 sccm; and a time from about 50 to 350 seconds.

24. The method of claim 20, wherein the thermal CVD deposited porous silicon oxide film has a density of from about 2.0 to 2.9 g/cm^3.

25. The method of claim 20, wherein the thermal CVD deposited porous silicon oxide film has a density of from about 2.2 to 2.4 g/cm^3.

26. The method of claim 20, wherein the first PECVD silicon oxide film pre-coating the CVD chamber inner walls is comprised of PE TEOS oxide; and the upper second PECVD silicon oxide film over the semiconductor wafer is comprised of PE SiH_4 oxide.

27. The method of claim 20, wherein the semiconductor wafer is pre-heated to from about 250 to 500°C.

28. The method of claim 20, wherein the semiconductor wafer is pre-heated from about 350 to 420°C.